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TVA Power Supply Analysis

- Potential Impact to Electric Coops

February 28, 2019

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---- C O N F I D E N T I A L & P R O P R E I T A R Y ----

Topics

- History & Background
- TVA Wholesale Power Supply and Trends
- Electric Cooperative – Wholesale Rate Analysis
- Competitive Analysis – Peer Suppliers
- City of Memphis - Developments & Risks
- Electric Cooperative - Analysis of Options
- Other Considerations



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History / Background



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TVA – History & Background

- Created under “TVA Act of 1933” ... largest government-owned utility
- Chartered to ... “provide navigation, flood control, electricity generation, fertilizer manufacturing, and economic development to the Tennessee Valley.”
- Service territory defined under TVA Act ... precluded from serving outside of “fence”
- Wholesale “all-requirements” power contracts with 154 non-profit “Local Power Companies” (LPCs) and certain large C&Is (>5 MW)
- TVA operates virtually free of competition* ... “Anti-cherry-picking” provisions limits 3rd-parties access to TVA transmission
- TVA is effectively exempt from FERC jurisdiction ... autonomy in determining system requirements, rate setting. TVA directors nominated by President, Senate confirmed.

* TVA competition limited to consumer self-generation, energy efficiency and emerging technologies that reduces dependency on traditional power supply.



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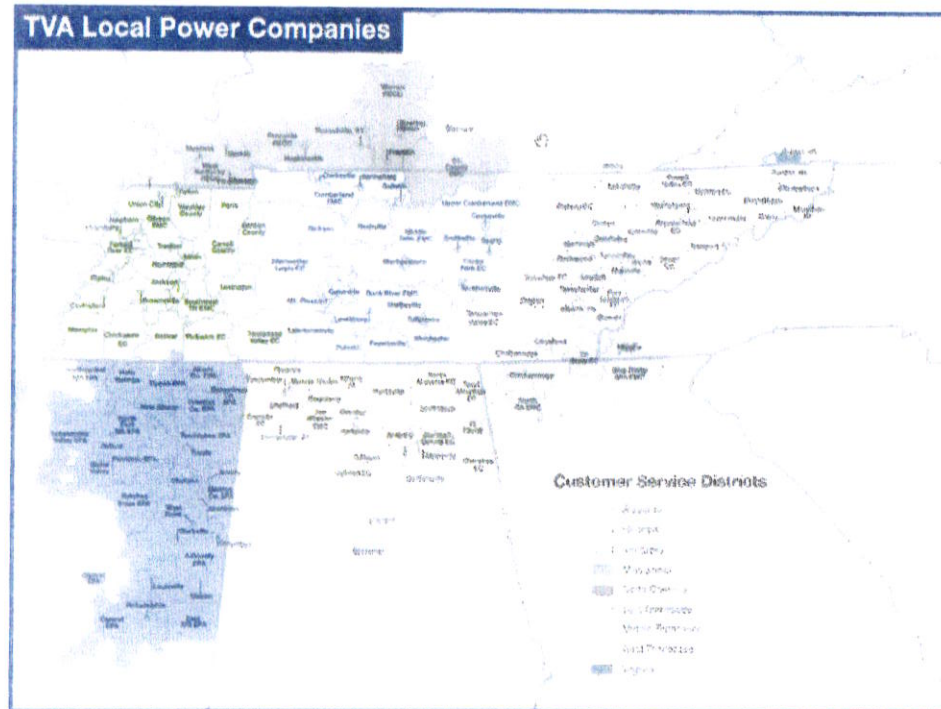
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TVA Service Territory

Predominant wholesale power supplier in:

- Majority of Tennessee
- Northern Alabama
- Northeastern Mississippi
- Southwestern Kentucky
- Portions of Georgia, North Carolina & Virginia



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Electric Cooperatives served by TVA

Tennessee

Volunteer EC
Tri County EMC
Middle Tennessee EMC
Gibson EMC
Duck River EMC
Cumberland EMC
Upper Cumberland EMC
Fort Loudoun EMC
Pickwick EC
Meriwether Lewis EC
Tennessee Valley EC
Sequachee Valley EC
Plateau EC
Holston EC
Appalachian EC
Caney Fork EC
Forked Deer EC
Mountain EC
Powell Valley EC
SW Tennessee EMC

Alabama

Cherokee EC
Cullman EC
North Alabama EC
Sand Mountain EC
Joe Wheeler EMC
Marshall-DeKalb EC
Franklin EC

Mississippi

Monroe County EPA
Central EPA
Tallahatchie Valley EPA
Prentiss County EPA
Tombigbee EPA
Natchez Trace EPA

Kentucky

Pennyrite Rural EMC
Warren Rural EMC
West Kentucky Rural EC C

Georgia

North Georgia EMC
Blue Ridge Mountain EMC
Tri-State EMC

North Carolina

Murphy Power

Virginia

Powell Valley EC

**34 Electric
Cooperatives**



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TVA – Wholesale Power Contracts

- Contract for “all-requirements” wholesale services ... delivery points on high-side of distribution substations
- TVA Board sets wholesale rates and transmission tariffs for wheeling services... have demonstrated the use of wheeling tariffs to discourage competition
- Contracts have termination provisions that allow LPCs to exit contracts with no financial buy-out or penalties with varying notice periods

Contract Arrangements	Number of LPCs	Sales to LPCs (2018 \$M)	% Total Operating Revenues (2018)
20 year termination Notice	3	\$ 133	1.2%
15 year termination Notice	11	\$ 498	4.5%
12 year termination Notice	1	\$ 26	0.2%
10 year termination Notice	51	\$ 3,507	31.2%
6 year termination Notice	1	\$ 49	0.4%
5 year termination Notice	87	\$ 6,049	53.9%
Total	154	\$ 10,262	91.4%



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Recent Trends in TVA Wholesale Power Supply

- TVA has been pursuing a strategy to reduce corporate debt while strengthening balance sheet ... has put upward pressure on wholesale rates
- Since 2015, TVA has been working with LPC community to re-structure wholesale rate design to reflect cost-of-service ... has resulted in introduction of “grid access charge (GAC)”
 - Seen as defensive action to discourage consumer investment in local renewable and DER investments
- Over next decade, TVA projecting flat-or-declining sales
- TVA has announced a long-term CAPEX spending plan - \$2.2B annually over next 3 years ... currently working on Integrated Resource Plan
 - Includes new generation to replace retiring coal assets - e.g. Bull Run (850 MW) and Paradise #3 (1,200 MW)



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Rate Analysis



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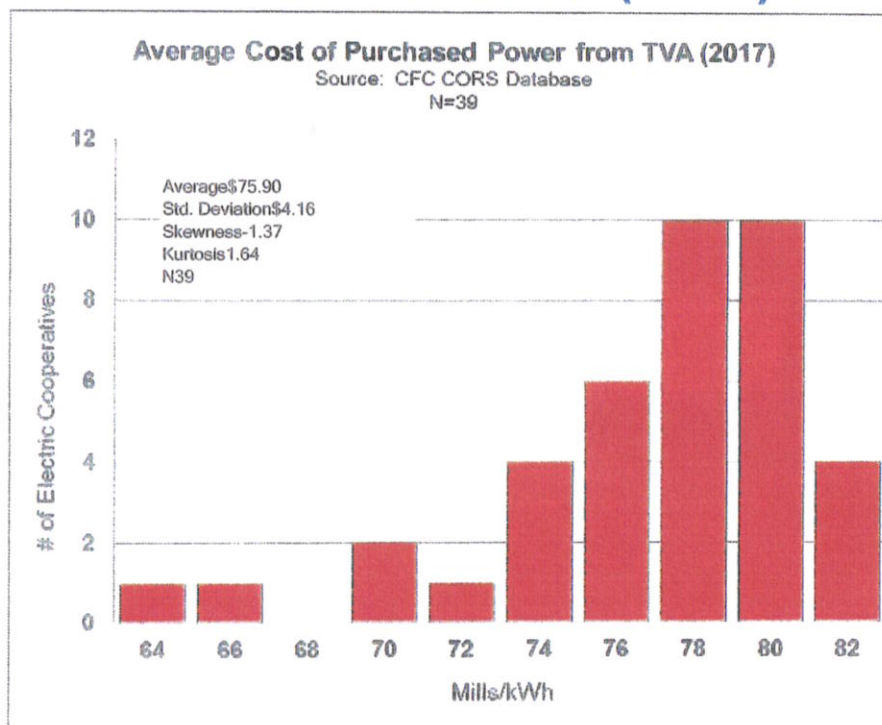
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TVA Electric Cooperatives – Wholesale Power Costs (2017)

- CFC analyzed power supply costs of **Electric Coops** served by TVA
- Using 2017 purchased power data, costs of wholesale power ranged from \$64 to \$82/MWh*

– Average	\$ 75.80/MWh
– Majority	\$ 78-\$ 80/MWh

* Variation dependent on load factor and treatment of C&I loads and other factors



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Competitive Analysis



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Comparable Regional Wholesale Power Providers (2017)

- CFC benchmarked neighboring regional wholesale providers ... comparable contracts include:
 - Kentucky Utilities \$63.37/MWh
 - Duke Energy \$59.86/MWh
 - + MISO South
- Average TVA EC WPC rates (2017)
 - \$75.90/MWh

TVA “premium” over other suppliers
... \$18-\$20/MWh (or 20%-25%)

		No. of	
		Class	Transactions
		MW	Cost\$/MWh
Sales for Resale			
Kentucky Utilities	RQ10	1,746,469	\$110,675,425\$63.37
Georgia Power	RQ1	240,501	\$21,895,135\$91.04
Duke Energy Resales	RQ12	17,718,883	\$1,060,624,836\$59.86
ENTERGY Arkansas	RQ 1	153	\$11,461\$74.91
Georgia Power	LU2	1,916,300	\$105,356,219\$54.98
Kentucky Utilities	SF1	421,609	\$9,761,641\$23.15
Kentucky Utilities	OS10	34,584	\$1,336,595\$38.65
Georgia Power	OS26	950,381	\$30,797,804\$32.41
Duke Energy Sales for Resale	OS12	117,747	\$11,606,338\$98.57
Purchased Power			
Duke Energy	RQ6	1,221,811	\$46,609,038\$38.15
Duke Energy	IU309	1,362,408	\$88,195,983\$64.74
Duke Energy	IU12	67,909	\$3,744,872\$55.15
Duke Energy	OS16	6,698,896	\$198,992,904\$29.71
ENTERGY Arkansas	OS6	4,134,406	\$231,615,646\$56.02

Source: FERC filings

Classes of sale/purchase are:

- (1) RQ Long-term firm service inclusive of ancillary services
- (2) LU Long-term service from one or more specified units
- (3) SF Short-term firm service
- (4) IU Intermediate-term (less than one year) from one or more specified units
- (5) OS Short-term non-firm service

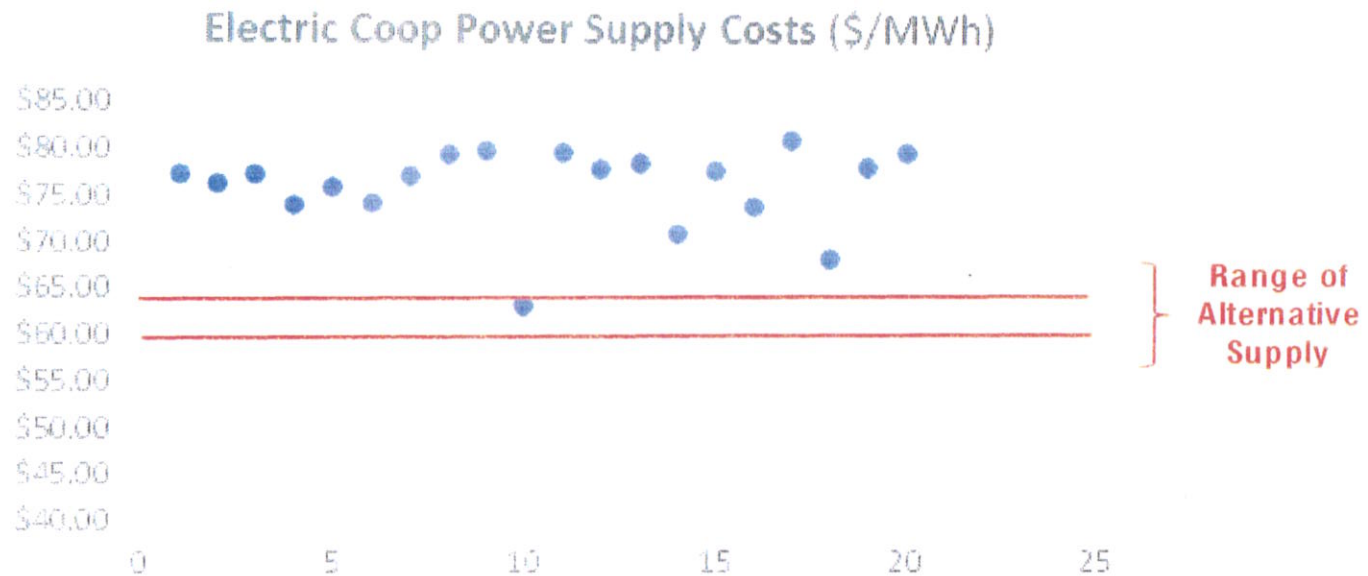


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TVA Wholesale Costs – TN Electric Coops (2017)

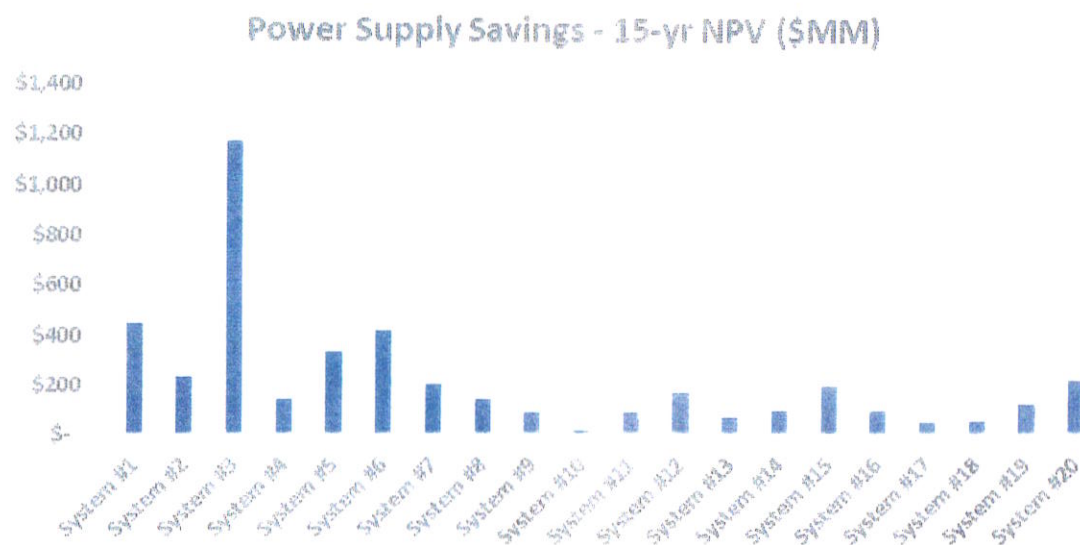


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15-Year Power Costs Savings – TVA vs. Others (2017)



	\$/year (\$MM)	15-yr NPV (\$MM)
System #1	\$ 34.5	\$ 449
System #2	\$ 18.1	\$ 236
System #3	\$ 90.0	\$ 1,172
System #4	\$ 10.7	\$ 140
System #5	\$ 25.5	\$ 332
System #6	\$ 31.7	\$ 413
System #7	\$ 15.5	\$ 202
System #8	\$ 10.6	\$ 138
System #9	\$ 6.6	\$ 86
System #10	\$ 1.2	\$ 16
System #11	\$ 6.8	\$ 89
System #12	\$ 12.8	\$ 167
System #13	\$ 5.1	\$ 67
System #14	\$ 7.1	\$ 93
System #15	\$ 14.7	\$ 192
System #16	\$ 7.2	\$ 94
System #17	\$ 3.3	\$ 43
System #18	\$ 3.9	\$ 51
System #19	\$ 8.9	\$ 116
System #20	\$ 16.8	\$ 218

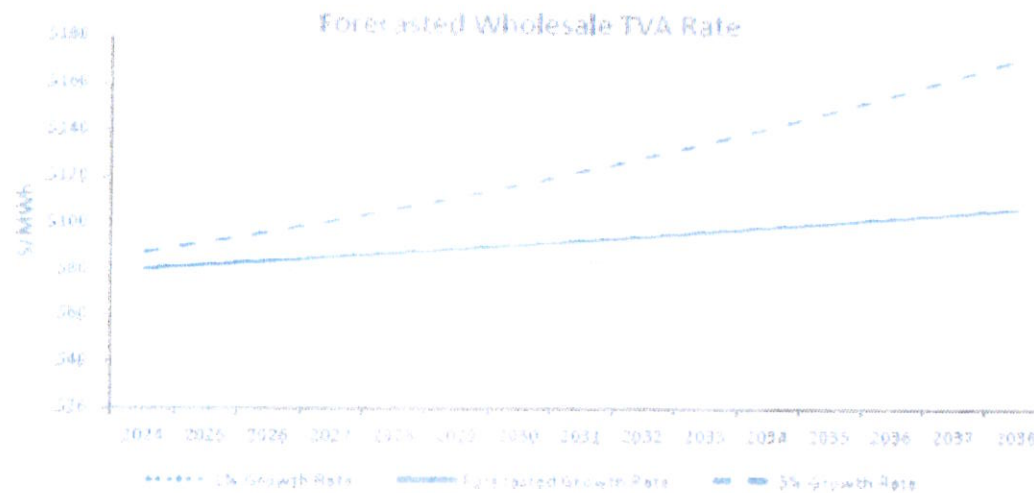


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Forecasted TVA Wholesale Rates - Aces Report (1/31/19)



TVA rates projected to increase 2.1% per year based on historical increases and inflation ... impact of recent CAPEX plan TBD



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City of Memphis / Risk Assessment



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City of Memphis Light, Gas & Water (MLGW)



- Established in 1939 ... serves 421,000 city customers
- Largest 3-service Municipal Utility in U.S.
... Electricity, Gas, Water
- Biggest TVA single-load ... 11% system demand,
9% total revenue
- Located on extreme southeast area of TVA service
territory ... proximity to MISO-South



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City of Memphis – MLGW Development

- MLGW “all requirements” contract @ ~\$70/MWh (2017)
- City desires to increase reliance on renewables ... inconsistent with TVA portfolio
- City retained GDS and Aces to conduct a **preliminary assessment of alternative power supply options** ... Presented at 1/19 MLGW Board meeting
- MLGW contract requires **5-year notice period** to exit TVA ... no earlier than 2024
- City likely to approve moving forward with formal IRP for completion in CY2019 ... strong chance that IRP will result in MLGW giving 5-year notice to leave TVA



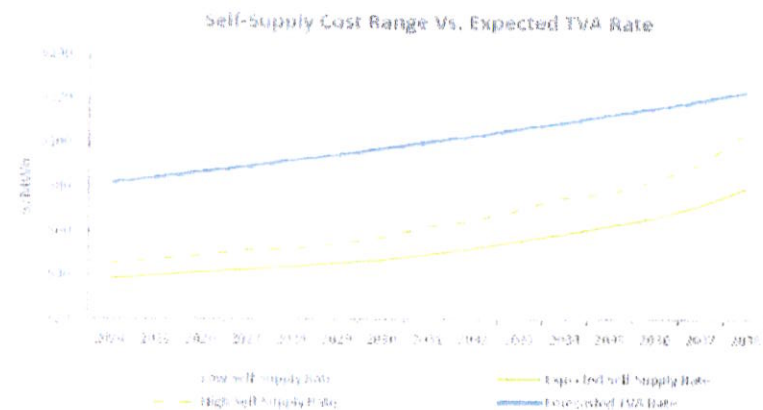
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MLGW Analysis – ACES Report

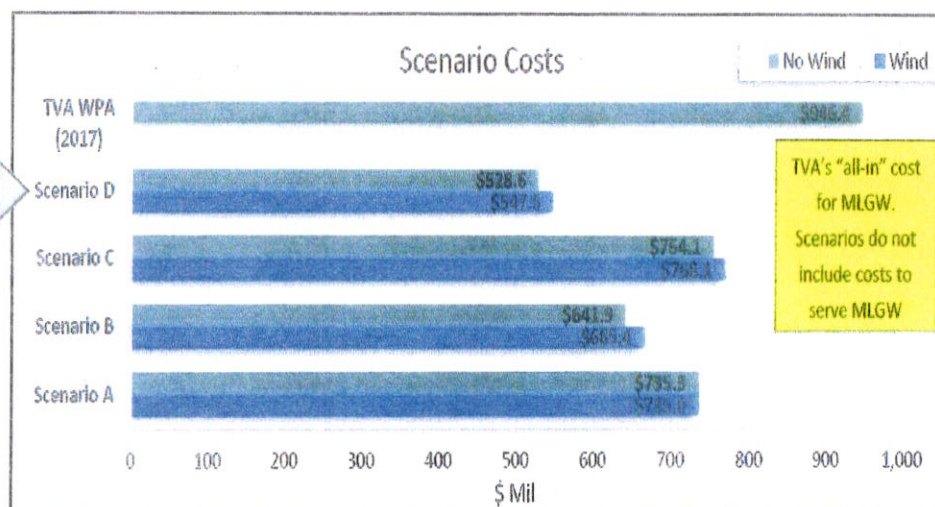
- Presented 1/31/19 ...
“Long-Term Portfolio Considerations”
- Projects 2.1% annual increase in
TVA wholesale power costs
- Estimated savings to MLGW:
 - \$9.2B over 15 year period (between
2024 - 2038, assuming start in 2024)
 - \$413 M to \$817 M annual savings
- Identified “Other Considerations”:
 - Greater control over Power Supply portfolio ... including extent of renewables
 - Potential risk(s) relating to possible TVA privatization
 - Potential risk(s) relating to potential future Carbon Legislation
 - Potential risk(s) over potential departure of other TVA customers (Impact on rates)



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MLGW Analysis – GDS Report

- Presented 1/28/19 ...
“Evaluation of Long-Term Power Supply Alternatives”
- 4 scenarios modeled using PROMOD including ...
“Scenario D” - Integration w/ MISO-South
- Analysis did not consider capacity & ancillary costs
- Concluded estimated savings of \$ 400 - \$ 420 M (annually?)



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Impact of MLGW exit to remaining TVA Systems

- MLGW represents TVA's single biggest load ...
 - 1,060 MW avg demand, 3,195 MW peak (2013)
 - 11% total Energy Sales, 9% Revenue
 - >\$1B annual purchases (revenue to TVA)
- Proximity to MISO-South presents opportunities (alternatives) to TVA supply

- Loss of MLGW load would result in an estimated 7.0% to 7.5% average rate increase to remaining TVA systems

MLGW Special Board Meeting – 1/29/19:

.... MLGW President and CEO J.T. Young

"We are looking at an integrated resource plan that would include public input and require Board approval. Then we would move to the RFP stage... All options are on the table."



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Investment Analysis Electric Coop access to 3rd-Party Transmission



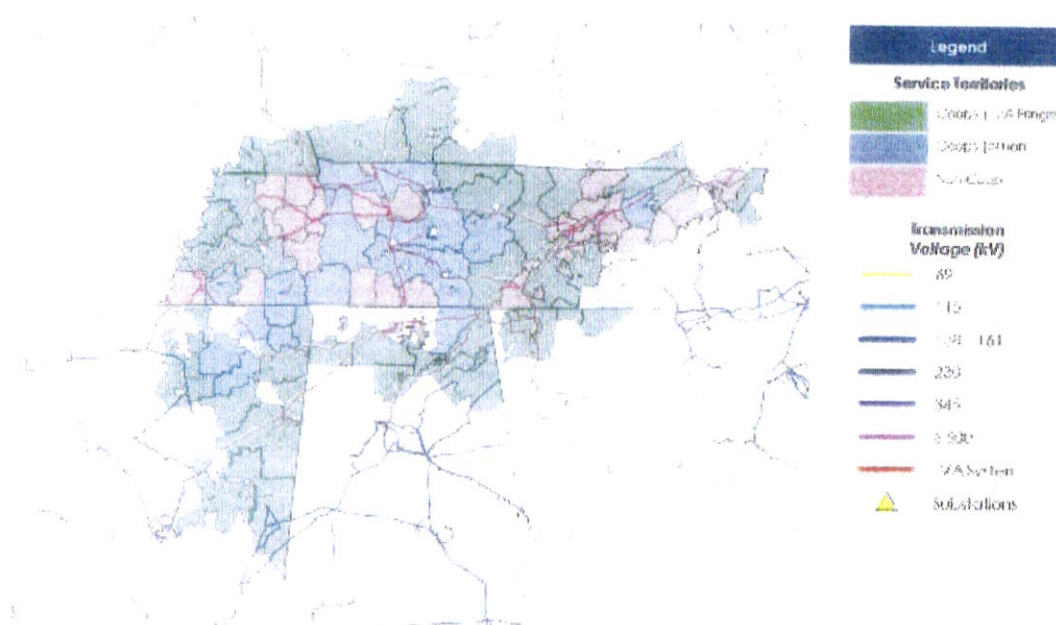
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Transmission Network – Interconnection Opportunity(ies)

- “Scoping analysis”
conducted analysis of
proximity to 3rd-party
transmission
- Systems on peripheral
(outside) of TVA service
territory (green) evaluated
- Distances between EC
substations & transmission
estimated ... along with
estimate of investment
- LPCs inside service territory
(blue, red) will have greater
challenges accessing non-
TVA transmission



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Transmission Interconnection – Scoping Analysis

Co-op	Interconnection Distance (miles) & Cost (\$x1,000) to non-TVA Transmission					
	115 (\$x1000)	138 – 161 (\$x1000)	230 (\$x1000)	345 (\$x1000)	≥ 500 (\$x1000)	
System 1			26.7 \$ 106,800		38.5 \$ 234,850	
System 2	14.1 \$ 36,660				30.6 \$ 186,660	
System 3			18.7 \$ 74,800		18.7 \$ 114,070	
System 4			51.7 \$ 206,800		51.7 \$ 315,370	
System 5			47.5 \$ 190,000		47.5 \$ 289,750	
System 6			21.0 \$ 84,000		32.8 \$ 200,080	
System 7	64.9 \$ 168,740		97.7 \$ 390,800		56.2 \$ 342,820	
System 8	22.3 \$ 57,980	21.3 \$ 61,770	33.9 \$ 135,600		29.4 \$ 179,340	
System 9	34.6 \$ 89,960					
System 10	33.8 \$ 87,880	42.2 \$ 122,380			35.2 \$ 214,720	
System 11		16.0 \$ 46,400		40.0 \$ 224,000		
System 12				18.6 \$ 104,160		
System 13			25.3 \$ 101,200	25.3 \$ 141,680		
System 14				53.8 \$ 301,280		
System 15			29.1 \$ 116,400		7.6 \$ 46,360	
System 16	27.3 \$ 70,980				17.6 \$ 107,360	
System 17						
System 18			61.2 \$ 244,800		25.9 \$ 157,990	
System 19			18.5 \$ 74,000		47.9 \$ 292,190	
System 20			7.1 \$ 28,400		48.8 \$ 297,680	
System 21	60.3 \$ 156,780				53.1 \$ 323,910	
System 22			92.4 \$ 369,600		44.0 \$ 268,400	
System 23			71.8 \$ 287,200			
System 24		82.6 \$ 239,640		45.4 \$ 254,240	81.0 \$ 494,100	
System 25	89.7 \$ 233,220			75.2 \$ 421,120		
System 26		31.9 \$ 92,610				
System 27		8.8 \$ 25,636	56.7 \$ 226,800			
System 28		60.8 \$ 176,320	4.0 \$ 16,000			
System 29		44.4 \$ 128,760	18.3 \$ 73,200		23.9 \$ 145,790	
System 30		35.6 \$ 103,240		19.3 \$ 108,080		
System 31				82.9 \$ 464,240		
System 32	39.3 \$ 102,180				12.2 \$ 74,420	
System 33			79.5 \$ 318,000		25.9 \$ 157,990	
System 34	34.4 \$ 89,440		25.7 \$ 102,800	33.8 \$ 189,280		

Cost Assumptions:

115 kv	\$2.6M per mile
138 kv	\$2.9M per mile
230 kv	\$4.0M per mile
345 kv	\$5.6M per mile
500 kv	\$6.1M per mile

NOTE: Estimated construction costs are for greenfield transmission based on PSC utility planning filings ... May not reflect full project costs and analysis has not considered distribution system design requirements.



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Transmission Interconnection – Scoping Analysis

Estimated Interconnection Costs and Payback based on potential Power Cost Savings

Co-op	Interconnection Investment	
	CAPEX (\$)	Payback (Years)
System #1	\$ 36,660,000	7.2
System #2	\$ 74,800,000	5.7
System #3	\$ 390,800,000	39.5
System #4	\$ 190,000,000	41.9
System #5	\$ 84,000,000	10.6
System #6	\$ 206,800,000	50.6
System #7	\$ 89,960,000	3.1
System #8	\$ 57,980,000	5.0
System #9	\$ 87,880,000	18.1
System #10	\$ 46,400,000	3.2
System #11	\$ 104,160,000	7.8
System #12	\$ 101,200,000	9.9
System #13	\$ 244,800,000	61.8
System #14	\$ 70,980,000	6.4
System #15	\$ 156,780,000	16.6
System #16	\$ 268,400,000	16.6
System #17	\$ 74,000,000	14.0
System #18	\$ 92,510,000	2.7
System #19	\$ 301,280,000	16.7
System #20	\$ 89,440,000	8.3
System #21	\$ 464,240,000	30.0
System #22	\$ 25,636,000	2.4
System #23	\$ 16,000,000	2.2
System #24	\$ 74,420,000	22.7
System #25	\$ 73,200,000	18.8
System #26	\$ 103,240,000	11.6
System #27	\$ 157,990,000	9.4



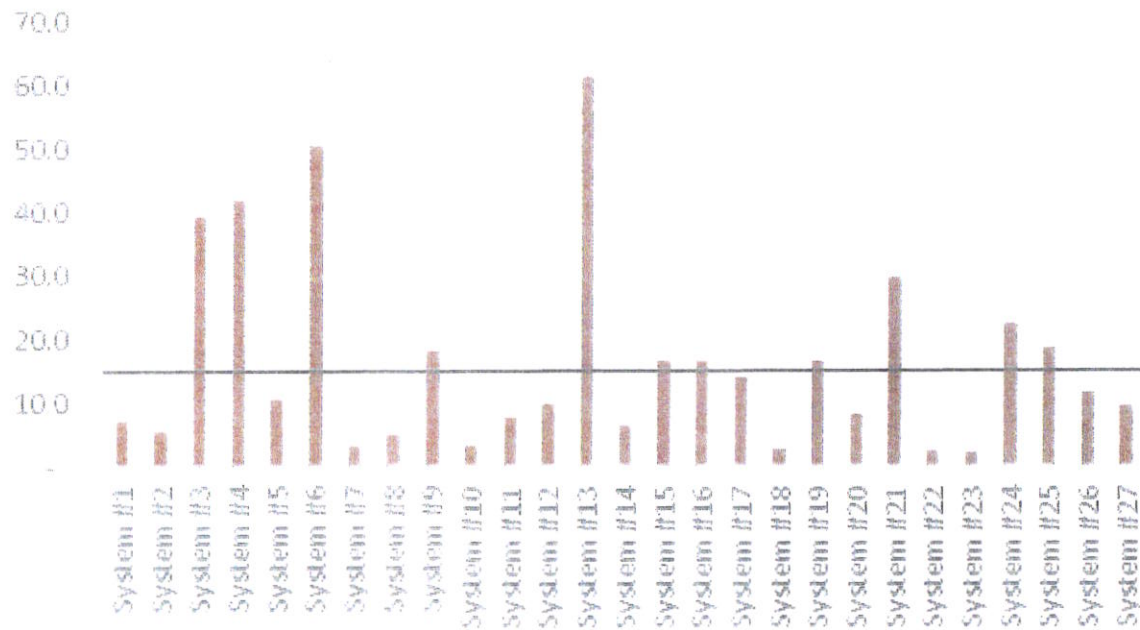
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Transmission Interconnection Analysis – PRELIMINARY

Interconnection Investment Payback (years)



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Other Considerations



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Other Considerations

- Unlike Electric Coop G&Ts that are long on capacity, TVA precluded from pursuing strategy of sales outside of immediate service territory ... loss of load could create stranded assets
- Possibility exists for further load-loss of TVA with other “peripheral” systems seeking 3rd-party transmission and supply
- Legal precedence of TVA being required to remain interconnected to LPC despite 3rd-party transmission supply ... compensation to TVA for ancillary services TBD
- Departure from TVA power supply may result in becoming regulated under State Commissions (e.g. Kentucky)
- Trend toward exiting LPCs may re-energize political debate over TVA privatization
- Loss of TVA regulation would likely require **initiation of member capital credits**
- Investigation of SEPA allocation with departure from TVA is recommended



Sources:

- TVA 10-k filing – dated September 2018
- Integrated Resource Plan – (date)
- FERC filings - numerous
- PSC Utility filings - numerous
- GDS Study – Evaluation of Long-Term Power Supply Alternatives (dated 1/28/19)
- Aces Study – Long-Term Portfolio Considerations (dated 1/31/19)
- Press Releases, Media articles - numerous



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